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**NOTES ON
THE PREVENTION AND
TREATMENT OF SCABIES,
1942.**

By Command of the Army Council,

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NOTES ON THE PREVENTION AND TREATMENT OF SCABIES.

INTRODUCTION.

Scabies is usually due to infestation of the skin with the itch-mite, *Sarcoptes scabiei* de Geer var. *hominis*. A number of races of *Sarcoptes* occur on animals, but man is not frequently infested with these.

The disease is usually contracted by close contact with an affected person, and the majority of cases occur in men or women who are not fastidious about their personal hygiene or the hygiene of those with whom they come in close contact. The present incidence of scabies in the Army will be reduced only when the significance of this is appreciated by all ranks.

INCIDENCE.

Before the present war, the disease was becoming annually more prevalent in the Army as well as among the civilian population, and, so far as the Army is concerned, the incidence remains high in spite of the measures adopted to combat the disease. It is very noticeable that although scabies occurs sporadically rather than in epidemic form, it is most prevalent in units in which discipline is slack and where insufficient attention is paid to the recommendations of the medical officers. Much depends on the officer commanding, who is primarily responsible for the hygiene of the unit, but it is the duty of the officer in medical charge to advise him in this matter.

The incidence in the Army for certain years, under varying conditions, is given below in ratios per 1,000 per annum :—

B.E.F. France.	United Kingdom.				
1914-1918.	1939-1940.	1914-1918.	1937.	1940.	1941.
42.71	34.44	19.27	7.4	20.00	40.77

In Great Britain there appears to be a seasonal variation in scabies. The incidence tends to fall during the summer and to rise during the autumn and winter, the zenith being reached in March or April.

CAUSAL AGENT.

Sarcoptes scabiei.—It is not proposed to describe the morphology of the mite. A knowledge of the insect's life-history and habits is important for present purposes, and is essential if our preventive measures are to be effective.

The female mite usually selects one of several definite sites and begins burrowing into the skin, in which she may be concealed after about one hour. She may then rest, or continue

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burrowing ; her activity seems largely to depend on the temperature of the host's skin, the period of greatest activity usually being when the host is warm. For this reason infection occurs readily in bed, or while holding the hand of an infected person while dancing or " petting."

The burrow is made in the horny layer of the epidermis at a speed which varies from one half millimetre to $4\frac{1}{2}$ millimetres in 24 hours. The female mite does not leave the burrow voluntarily, but lays her eggs within its confines and after six or seven weeks dies. During the period of oviposition, two or three eggs are laid each day ; it has been stated that the average complete clutch is 40 to 50 ova, but it is seldom that so many are found in a burrow.

The eggs hatch in about three days, and active larvæ emerge ; these leave the burrow, crawl over the surface of the skin and invade adjacent hair follicles, where they make little burrows in that part of the horny layer of the epidermis which dips into the opening of each follicle.

The larva moult into a nymph ; the next moult produces either an adult male, or an immature female which has to moult once again to produce an adult female. The males, which are rarely seen, live either on the surface of the skin or in small superficial "pockets" which they make in the epidermis. The immature females roam over the surface of the body, making very short burrows, less than one millimetre in length, from which they emerge to wander over the skin. They do not make a lengthy burrow until after fertilization. There is much wastage of life ; eggs do not hatch, larvæ or nymphs are destroyed or die, and only in a very small proportion of cases is the life-cycle completed. Despite the fertility of the mite, it is unusual to find more than 14 ovigerous adult females on a person suffering from scabies, and, if scratch marks and septic lesions are excluded, the majority of the lesions seen on the trunk and limbs are made by the larvæ and nymphs. Nevertheless, it is probable that infestation from person to person is often due to the transference of a newly-fertilized female.

The life-cycle, which occupies a period of about 7 to 14 days, may be summarized as follows :—

Egg stage	$2\frac{1}{2}$ to 4 days.
Larval stage	$1\frac{1}{2}$ to 3 days.
First nymphal stage	$1\frac{1}{2}$ to $2\frac{1}{2}$ days.
Immature female	2 to 4 days.

EFFECTS OF TEMPERATURE AND MOISTURE ON SARCOPTES.

Our views with regard to the effects of temperature and humidity on the life of the itch-mite have recently been altered. " *Sarcoptes* appears to be killed within five minutes

if exposed to any temperature above 120° F. (49° C.) and humidity of the air has no effect on the thermal death point. At lower temperatures the mites survive for several days away from the host, the maximum period for any mite being 14 days at 55° F. (13° C.) and 90 per cent. relative humidity. At higher or lower temperatures the mites seldom survive more than a day or two, and it appears unlikely that they would survive for more than two days in garments airing in a warm room (81° F. (27° C.))." (K. Mellanby.)

METHOD OF INFESTATION.

Undoubtedly by far the most usual mode of spread is by bodily contact, e.g., soldiers sleeping at home with their families who are infested, or men living in close proximity at a time when temperatures are such that migration of mites is facilitated. Hand-holding, as in dancing, may be a means of infection.

Spread may occur by the communal use of infested clothing, e.g., the shorts and vests used for football, hockey and boxing, the gauntlets and jerkins worn in the gymnasium, and perhaps also by towels; infection from infested blankets can also happen, but blankets can be inculpated in only a small percentage of cases.

INCUBATION.

The period which may elapse between the time when a person is first infested with *Sarcoptes* and the development of symptoms and signs which enable a clinical diagnosis to be made, varies considerably. On clinical evidence there is good reason to assume that many cases develop 11 to 25 days after exposure to infection, but clinical and experimental evidence both indicate that in some cases the incubation period may be longer. K. Mellanby has shown that a month or longer may elapse after infestation before the daughters of the original invading mite or mites begin to lay their eggs; thus six or more weeks may pass after exposure to infection, before the patient develops generalized scabies.

DIAGNOSIS.

The classical symptom is itching, worst at night and usually developing soon after the patient gets into bed; but the patient does not always complain of this, and he may state categorically that he does not itch. In the case of a person who has never before had scabies, some time may elapse after infection before itching becomes a predominant feature. A sensitive person may notice slight irritation due to the presence of larvæ in the follicles, and he may even notice a slight follicular eruption—but several weeks may pass before the skin becomes sensitized to a substance (the saliva ?

produced by the mite and the typical symptom of itching becomes predominant. When sensitization occurs, intense irritation is felt intermittently at the sites of the burrows and in the follicles ; typical erythematous follicular papules form, and occasionally small weals may develop at the sites of the burrows. It is in this sensitized condition that the patient suffers discomfort and scratches himself. As a result of scratching minute blood-crusts form on the apices of the papules, and secondary infection may occur ; this latter complication kills all *Sarcoptes* which are present in the infected sites, but may make diagnosis difficult. "When a patient is cured of scabies the symptoms may not disappear immediately. Even when there has been no extensive secondary infection, some of the burrows and papules in a sensitized individual may remain irritable for many weeks. For some days after the cure, areas where a burrow existed, but in which no mite or eggs remain, may periodically (perhaps for a period of one hour every twenty-four hours) form a distinct weal and irritate considerably. Cases in which irritation persists after the removal of the mite are common and give rise to the view that the cure has been incomplete. In particular, if such a patient scratches and again become secondarily infected, it is very difficult to distinguish his condition from that of a person with an infestation of live parasites."

(K. Mellanby.)

The scabies eruption consists of burrows and follicular papules ; the lesions may be modified by scratching and secondary infection. The burrows appear as thin sinuous lines, usually from 1 to 10 mm. in length. At the closed end of the burrow the *Sarcoptes* can be seen (in a good light, with the aid of a lens) as an oval, glistening body at the anterior end of which there is a small brown speck which indicates the position of the mouth parts and fore-legs. A vesicle may be present a millimetre or two behind the burrowing mite ; usually the presence of a vesicle in the neighbourhood of a burrow denotes the presence of *Sarcoptes*. The folliculo-papular eruption is frequently associated with excoriations due to scratching.

The lesions caused by the mite are most noticeable in the following situations, which should be examined seriatim when scabies is suspected :—

- (1) The webs of the fingers.*
- (2) The anterior aspects of the wrists.
- (3) The inner and posterior aspects of the elbows.

* Frequently, in soldiers, the webs of the fingers are not affected, but these areas should always be examined.

- (4) The anterior axillary folds.
- (5) The breasts, in women.
- (6) The navel and abdomen.
- (7) The shaft of the penis, on which an erythematous papule, pathognomonic of scabies, is often seen.
- (8) The buttocks.
- (9) The knees, ankles and toes.

In adults, the face and scalp are never affected.

The discovery of *Sarcoptes* in a burrow is the only indisputable proof of the disease, especially in cases of sulphur dermatitis or post-scabietic pruritus, when itching is of no diagnostic value.

The regimental medical officer should be able to recognize the mite, and after two or three days spent in examining cases, he should be able, with the aid of a lens, to make a speedy diagnosis. The itch-mite may be removed from the epidermis in the following manner: a sterilized darning needle (or a histological needle) is placed on the surface of the skin and pushed gently along the length of a burrow until it reaches the site of the mite. With a gentle rotary movement the point is moved under the insect, and the burrow is opened by gentle upward leverage. The mite should then be seen as a minute white speck adhering to the steel near the point of the needle, and can be transferred to a slide for microscopical examination.

COMPLICATIONS.

The majority of these arise as a result of the inoculation of pathogenic organisms by scratching.

1. Boils . . All cases of furunculosis should be examined to ensure that the predominant lesions are not masking scabies.
2. Ecthyma . . This is a type of impetigo, the lesions being superficial ulcers (often surrounded by a red areola) covered with a brown crust. Ecthyma usually affects the legs and may arise during the infestation, or after the scabies has been cured.
3. Impetigo contagiosa . . This complication usually affects the "points" of the elbows and the lower parts of the buttocks. In these sites it is almost pathognomonic of scabies.
4. Pustules . . Pustular folliculitis of the thighs or other areas may develop. Small bullæ containing bright greenish-yellow pus may be seen, especially on the hands; these may be associated with lymphangitis and may mask the original infestation.

5. Dermatitis.. Three types, of different ætiology, may be noted :—

- (1) Infective dermatitis, due to infection with, and sensitization of the skin to, pyogenic organisms. Any area may be affected, but this complication tends to be most severe in the flexures and folds of the skin.
- (2) Eczema, not infective in origin, which occurs in eczematous subjects, the lesions arising as a result of scratching.
- (3) Dermatitis medicamentosa, caused by soap, spirit, or the remedy employed, particularly sulphur. Sulphur dermatitis usually begins on the forearms and flanks.

6. Venereal Disease ..

The organisms of syphilis or soft sore may gain entry at the site of a scabies lesion, which then becomes indurated or ulcerates. This complication is rare, but should be remembered.

ROUTINE INSPECTIONS.

The men are stripped so that the upper limbs, trunk and thighs can be examined. The room should be well-lit and warm. All men showing the lesions and eruptions already referred to are segregated and the remainder are dismissed.

In practice the diagnosis at inspection depends chiefly on three factors :—

- (i) The occurrence of burrows on the wrists or penis.
- (ii) Impetiginous lesions on the elbows and the buttocks.
- (iii) Suspicious papules and excoriations on the anterior axillary folds and abdomen.

DIFFERENTIAL DIAGNOSIS.

1. **Lice infestation.**—If infested with body lice the patient usually has, as a result of scratching, linear excoriations on the shoulders, waist, buttocks and thighs (*i.e.*, on the areas of closest contact with the clothes). Body lice and their ova will nearly always be found, not on the patient, but on his clothes, which should be examined carefully.

The symptoms of infestation with crab-lice (*Phthirus pubis*) are usually much less severe than those of pediculosis corporis or scabies. In some cases the itching is negligible, but, in others, scratch marks may be found in the affected zones (pubic area, perineum, peri-anal area, axillæ, etc.) and sometimes a pustular eruption may be present. Maculæ cœruleæ ("blue spots"), which do not fade on pressure, may also be

noted, and on close examination ova will be found attached to the hairs. In 1917, MacCormac noted that lice do not feed from the skin of the penis; *Sarcoptes* has no such scruples, and therefore a generalized itching eruption associated with a penile lesion is more probably scabies than pediculosis. It should be remembered that not infrequently "crab-lice" are found on patients who are suffering from scabies. Scabies and pediculosis corporis may co-exist, but under present conditions this is not frequently seen.

2. Venereal disease.—Lesions on the penis may suggest a venereal infection. In doubtful cases the patient should be referred without delay to a venereologist.

3. Urticaria.—The lesions are red blotches or weals; burrows are not present. In papular urticaria the eruption is usually confined to the covered parts of the body.

PROPHYLAXIS.

It is the duty of unit medical officers to impress on their commanding officers the need for vigilance in combating scabies. In lectures to all ranks, medical officers should emphasize the fact that scabies is usually acquired by bodily contact; all ranks should ascertain if their people at home have symptoms of scabies, and if so, should insist that they seek medical advice. It should be stressed that in civilian life treatment can usually be obtained from the Public Health Authorities without cost and without loss of working hours. The provisions of the Scabies Order, 1941, should be implemented provided there is no doubt that the disease has been contracted on leave at home (*see A.C.I. 1017 of 1942*). Tact is necessary, as men resent the suggestion that wives or families may be affected. Stress should be laid on the fact that, under conditions of war, to suffer from a parasitic disease is to be unfortunate, but that it is culpable to conceal the disease and to infect other people.

The routine skin inspection, which should be held at least once a month, is a valuable method of preventing the concealment and dissemination of scabies. Medical officers should endeavour to attain a high standard of proficiency in these inspections, the technique of which is described in a preceding paragraph.

Other routine preventive measures include:—

- (1) Bath discipline. Every man should be made to have a hot shower at least once a week, thoroughly lathering himself with soap and drying himself with a towel.
- (2) Prohibition of the interchange of sports clothing, unless the garments have been previously

laundered. It may be noted here that laundering of all but woollen garments is certain to kill *Sarcoptes*.

- (3) Education of men to report sick immediately if they notice an eruption or itching.
- (4) Disinfestation of blankets by steam or hot air. Unless done at intervals of three weeks or less, this measure is probably ineffective as regards prevention of scabies; if the incidence of scabies in a unit rises rapidly, frequent disinfestation of blankets and clothing should be carried out.

TREATMENT.

Under conditions of active warfare.—Treatment should be carried out in unit lines, without segregation of the patients or disinfestation of their clothing and bedding, as follows:—

(1) As soon as possible after the medical officer has made the diagnosis, the patient will be painted from neck to feet with a 20-25 per cent. aqueous emulsion or spirit solution of benzyl benzoate, special attention being paid to the sites of election of the disease. The patient will not receive a preliminary bath before the application of the benzyl benzoate.

(2) The emulsion or solution will be allowed to dry, and within ten or fifteen minutes a second painting will be made.

(3) The second coat of benzyl benzoate will be allowed to dry and the patient will put on his clothes and return to duty.

(4) Twenty-four hours after the first application of benzyl benzoate a second application (*i.e.*, two paintings from neck to feet within a period of fifteen minutes) will be made; 24 hours later he will have a slipper or shower bath, or, if these are not available, will wash from neck to feet with water from a bucket.

(5) The patient will not wash during the 48-hour period of treatment. If engaged on fatigues or other duties which involve exposure to dirt, he may wash his hands and face, but the wrists and hands will be re-painted with benzyl benzoate as soon as possible after the washing. The strictest compliance with these instructions is essential, as it is in respect of these that failure of co-operation means failure in therapy.

(6) If the patient is normally employed in the cook-house his duties should be changed for a period of 48 hours after the first application of the treatment.

(7) Every man treated for scabies will report for medical examination to the officer in medical charge of his unit once weekly for a period of six weeks after treatment, and will be examined to ensure that there is no relapse.

(8) Cases which fail to respond to treatment will be referred without delay to the nearest military hospital where a dermatologist is available.

Under static conditions.—The following facilities may be made available for men ; they should be made available for women under all conditions of service :—

- (1) A ward in which the cases can be isolated.
- (2) A bathroom, adjacent to the ward, with an adequate supply of hot and cold water. Slipper baths are preferable to showers.
- (3) A warm treatment-room, temperature 75° F. (24° C.) adjacent to the bathroom.
- (4) An adequate supply of soft soap and specific remedies.
- (5) Hospital clothing.
- (6) A hot air disinfecter or steam disinfecter.
- (7) Personnel : the medical officer should have experience in the diagnosis and treatment of scabies and should be assisted by intelligent, trained orderlies.

As soon as possible after admission the patient should remove his clothing, which should be sent with his blankets for disinfestation by exposure either to steam or to air heated to 149° F. (65° C.). The patient should proceed to the bathroom, and should lie in the bath in water at 105° F. (41° C.) for ten minutes. He should then rub himself thoroughly all over with soft soap, using in all about two ounces, until a creamy lather results. Re-entering the bath he should rub the skin gently with a flannel or nail brush in order to open up the burrows, paying particular attention to the sites of election stated above. About five to ten minutes should be allowed for this procedure. Then, after washing off all the soap, he should leave the bath, dry himself thoroughly and pass on to the warm treatment-room, where he will be treated with benzyl benzoate or sulphur. Suitable arrangements should be made for the disinfestation of towels and flannels.

BENZYL BENZOATE.—If benzyl benzoate is used it may be employed dissolved in spirit or emulsified in water. In either case the optimum concentration of benzyl benzoate is 20–25 per cent. The lotion or emulsion should be applied by an orderly with a suitable brush and painted on from neck to feet, care being taken than no part of the integument of trunk or limbs is left untreated. Particular care should be taken to treat the webs between fingers and toes, the elbows, axillæ, penis, scrotum and buttocks. When the first coat has dried, a second is applied. The patient puts on a cotton shirt and hospital blues and goes to the ward ; he is instructed not to wash for 24 hours. He should then receive a second bath, followed by another application of the benzyl benzoate, and, 8 or 12 hours later, a final cleansing bath before discharge. If, after the last bath, the skin is reddened or irritable, an application of calamine lotion is beneficial.

SULPHUR.—As a routine, ungu. sulphuris (B.P.) 10 per cent., or better, two parts of this added to one part of ungu. zinci oxidii is used. The ointment should be kept in a covered container; a portion of about two ounces should be served with a clean wooden spatula on to a clean piece of paper and given to the patient after his bath. Twenty minutes should be spent in rubbing the ointment thoroughly into the skin of the trunk and limbs, the patient being assisted in treating his back. After the inunction the patient should go to bed, as the efficacy of the ointment is increased if the skin is kept warm. One application of the ointment after a bath on three successive days is usually sufficient. In very early cases one application of the B.P. ointment, followed by sitting in the warm treatment-room for two hours is sufficient.

In an efficient station the relapse rate should be less than 3 per cent. After completing treatment all cases should be examined once a week for six weeks by the unit medical officer, so that, if the patient is not cured, he can be referred for further treatment.

In any case in which there are severe septic complications, treatment under the direction of a specialist is necessary, and such cases will be referred to a dermatologist at once.

Dermatitis may develop as a complication after the use of any of the above procedures. It usually reacts well to calamine lotion or liniment. It is important to remember that blonde persons are more sensitive to sulphur than brunettes, and that itching after treatment does not necessarily mean that the patient is not cured.

THE SUCCESS OF ANTI-SCABIETIC TREATMENT DEPENDS FAR LESS ON THE TYPE OF REMEDY EMPLOYED THAN ON THE THOROUGHNESS WITH WHICH THE TREATMENT IS CARRIED OUT. FAILURE TO CURE IS COMMONLY DUE TO CARELESS OR INSUFFICIENT TREATMENT.

POLICY.

Policy with regard to scabies is influenced fundamentally by two factors, the first of these being the difficulty of controlling the incidence of the disease in an Army which is in intimate relationship with a heavily-infected civilian population, and the second factor being the necessity for rapidity of treatment.

We must continue to rely on most of the measures whereby we have succeeded in keeping the incidence of scabies within reasonable limits; these include insistence on the necessity for

early and accurate diagnosis, thoroughness of treatment, and the prevention of concealment of disease by skin inspections made at least once a month by the unit medical officers.

It is important that the provisions of A.C.I. 1017 of 1942 should be implemented whenever possible, so that, when scabies is known to have been contracted on leave at home, the civilian authorities are informed and can take action under the terms of the Scabies Order, 1941.

The exigencies of the Army during hostilities require that whenever possible cases should be treated in unit lines. Uncomplicated cases of scabies will continue at duty: disinfestation of clothing and bedding will not be carried out.

It is necessary, therefore, under these conditions that every effort should be made to ensure the success of treatment in unit lines; commands should arrange for courses of instruction in the diagnosis and treatment of scabies to be given by specialists in dermatology to hygiene officers, who will visit, advise and instruct officers in medical charge of units. The work of scabies instruction will be carried out by Officers Commanding, Field Hygiene Sections, Assistant and Deputy Assistant Directors of Hygiene (corps and districts), etc.

Experiments in therapy will not be undertaken unless the permission of the D.D.M.S. has been obtained, but regimental and other medical officers should investigate thoroughly all outbreaks of scabies and forward their observations to the hygiene officer of the area or formation to which they belong. This information will be of value in increasing our knowledge, for there is still a considerable amount of information required with regard to the prevention, incubation period and mode of spread of scabies.

APPENDIX.

FORMULA FOR MAKING 80 OUNCES BENZYL BENZOATE EMULSION.

- (1) Shred 528 grains lanette wax sx.
- (2) Boil 40 ounces of water.
- (3) Remove the water from the source of heat and add the lanette wax.
- (4) Dissolve the wax by gentle rotation. Ensure that the wax dissolves completely and that no aggregations remain.
- (5) Cool to about 40° C. (104° F., approximately the temperature of a hot bath) and pour into a "Winchester" quart bottle.
- (6) Add 20 fluid ounces benzyl benzoate.
- (7) Shake the bottle vigorously.
- (8) Add 20 ounces water and shake the bottle again. An excellent emulsion will be produced, and there is no need for prolonged shaking.
- (9) After 24 hours shake the bottle.

The medical officer should make sure that the emulsion is not used wastefully.

An average amount of 2 fluid ounces is required to cover the body, so that in the complete treatment of each case not more than 8 fluid ounces should be used.

The emulsion does not keep stable indefinitely; requirements should therefore be estimated carefully, and large quantities should not be prepared if only small numbers of cases have to be treated.